TAXONOMY AND DISTRIBUTION OF THE SCINCID LIZARD *SAPROSCINCUS CHALLENGERI* AND RELATED SPECIES IN SOUTHEASTERN AUSTRALIA

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The skink *Saproscincus challengeri* is here recognised as comprising three species on the basis of allozymic and morphological variation. *S. challengeri* is redefined and restricted to the McPherson Range region, southeastern Queensland. The names *Saproscincus galli* Wells & Wellington (1985) and *Saproscincus rosei* Wells &Wellington (1985) apply to two widespread species. All species occur almost exclusively in closed forest. *Mocoa spectabilis* De Vis, 1888 is shown to be a senior synonym of *Saproscincus basiliscus* (Ingram & Rawlinson, 1981). □ *Scincidae, Saproscincus, taxonomy, electrophoresis, distribution, rainforest.*

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As our knowledge of the taxonomy and relationships of the Australian scincid lizard fauna has been refined in the past two decades, a number of widespread species have been found to be composite. One such example is the species *Lygosoma challengeri* Boulenger (1887), which was formerly regarded as widespread in closed forests of northern New South Wales and Queensland (Worrell, 1963; Dale, 1973; Cogger, 1975). This taxon has variably been assigned to the genus *Leiolopisma* (Cogger, 1975), *Lampropholis* (Greer, 1974) and the *challengeri* species group within *Lampropholis* (Greer & Kluge, 1980). The latter species group was regarded as generically distinct by Greer (1980) and subsequently given the generic name *Saproscincus* by Wells & Wellington (1984). Greer (1980) and Greer & Kluge (1980) listed two additional species in the complex from the northern end of the distribution. One of these, *Lampropholis tetradactyla*, was a new discovery (only two records were known prior to 1974), while the other, which Greer & Kluge diagnosed but left undescribed, represented northern populations previously assigned to *L. challengeri* (Worrell's 1963 diagnosis of *challengeri* was at least partly based on the northern taxa). The second species was subsequently described as *Lampropholis basiliscus* (Ingram & Rawlinson, 1981), with a third northern species in the *challengeri* group, *Lampropholis czechurai*. Consequently the name *challengeri* was restricted to southern (SEQ-NENSW) populations within the complex, although no author had redefined that species.

The possibility of the restricted *S. challengeri* being composite was suggested by Wells & Wellington (1985), who named two additional species, *S. galli* and *S. rosei*, both from single specimens, and by Wilson & Knowles (1989), who figured several distinctive morphotypes from SEQ. Neither gave evidence to distinguish these taxa at the species level.

An undescribed member of the *challengeri* species group from the Sydney region has been known for many years (e.g. Griffiths, 1987). Several specimens of the same taxon (one figured by Wilson & Knowles, 1988, pl.502) were collected (RAS) in the Bellingen region, NENSW, in 1983, a northern extension of the known distribution of over 400km. The discovery of this species in regional sympatry with what was then considered typical *S. challengeri* initiated the investigations reported here.

MATERIALS AND METHODS

The species recognized are identified by possessing unique combinations of both morphological and electrophoretic characters, and their species-level distinction is supported by field observations relating to distribution, habitat preferences, and the occurrence of sympatry between species.

Electrophoretic procedures: Electrophoresis of liver samples was performed on 'Titan III' (Helena, Austin) cellulose acetate gels according

to standard procedures (Hebert & Beaton, 1989). Gels were run for 60 minutes, with a eonstant potential drop of 200V between eleetrodes. Twenty-one enzyme systems encoded by 24 loei were seored. Staining protoeols were adapted from Harris & Hopkinson (1977) and Hebert & Beaton (1989). Fluorescence methods were used for esterase and negative stains for superoxide dismutase. The enzymes stained, abbreviations used herein, Enzyme Commission numbers, running buffer and number of presumptive genetie loei are given in Table I. Tissue was ground in 1 volume of tissue to I volume of homogenising buffer (100ml tris-HCl, pH 7.0, 1mM Na_2 EDTA, 0.5mM NADP and 50µl/100ml β-mereaptoethanol) in hand-held glass homogenisers. Allozymes are designated in order of their relative anodal mobility, as are different loei eneoding the same enzyme. Results were analysed using the BIOSYS-1 package of Swofford & Selander (1981).

Morphological studies: All speeimens of *S.challengeri* in the Australian and Queensland Museums were examined. Specimen registration numbers for Australian Museum (AMS) specimens are prefixed R and Queensland Museum (QM) specimens, J. From this material 23 series of speeimens, eorresponding to most of the samples analysed biochemieally, but in some cases enlarged by the addition of specimens from the same or nearby localities, were examined for the full suite of eharaeters listed below. Measurements (axilla to groin, hindlimb, and tail lengths) are expressed as percentages of snout to vent length (SVL) in the taxon aeeounts.

The following eharacters were scored for eaeh specimen where possible: Axilla to groin distance (AGL). Hindlimb length (HLL) - measured from groin to tip of fourth toe including nail. Tail length (TL) - measured from caudal edge of anal seales to tip of tail, on eomplete original tails only. Supraeiliaries (SCIL) - first row of enlarged scales above eye posterior to prefrontal scales and bordering supraoeular seales. Last scale in series is that abutting the posterior edge of the fourth supraocular. Midbody scale rows (MB) - number of longitudinal scale rows around body counted midway between axilla and groin. Paravertebral seales (DSR) - number of scales in a paravertebral row from first seale posterior to parietal seale to last scale anterior to level of vent opening. Fourth finger (FS) and toe (TOES) scales - number of dorsal seales on fourth digit of foot and hand. Distal scale eontains claw and basal seale broadly contaets adjacent basal scale of third finger or toe. Fourth finger (FL) and toe (TOEL) lamellae - number of ventral scales on fourth digit of foot and hand. Distal seale contains elaw and basal scale is last largely undivided seale at a point level with intersection of third and fourth digits.

TABLE 1. Enzymes stained (1), abbreviations (2), Enzyme Commission numbers (3), running buffer (4) and number of presumptive genetic loci (5).

1	2	3	4	5
Adenylate kinase	AK	2.7.4.3	TEM 50	1
Aspartate aminotransferase	AAT	2.6.1.1	TC 100	2
Esterase	EST	3.1.1.1	TEM 50	2
Fructose bisphosphatase	FBP	3.1.3.11	TEM 50	1
Fumarate hydratase	FH	4.2.1.2	TEM 50	1
Glucosephosphate isomerase	GPI	5.3.1.9	TEM 50	1
Glucose-6-phosphate dehydrogenase	G6PD	1.1.1.49	TC 100	1
Glyceraldehyde phosphate dehydrogenase	GA-3-PDH	1.2.1.12	TEM 50	1
β-Glycerophosphate dehydrogenase	GPD	1.1.1.8	TEM 50	1
Isocitrate dehydrogenase	IDH	1.1.1.42	TEM 50	2
Lactate dehydrogenase	LDH	1.1.1.27	TC 100	1
Malate dehydrogenase	MDH	1.1.1.37	TEM 50	2
Mannosephosphate isomerase	MPI	5.3.1.8	TEM 50	1
Peptidase (leu-ala substrate)	PEP-la	3.4.11	TEM 50	1
Peptidase (leu-gly-gly substrate)	PEP - lgg	3.4.11	TEM 50	1
Peptidase (phe-pro substrate)	PEP - pp	3.4.11	TEM 50	1
Phosphoglucomutase	PGM	2.7.5.1	TEM 50	1
6-Phosphogluconate dehydrogenase	6-PGDH	1.1.1.44	TEM 50	1
Superoxide dismutase	SOD	1.15.1.1	TEM 50	1
Triosephosphate isomerase	TPI	5.3.1.1	TEM 50	1
UDP glucose pyrophosphorylase	UDPG	2.7.7.9	TC 100	1

Bilaterally scorable characters (SCIL, FS, FL, TOES, TOEL) were scored on both sides and the mean value used.

Apart from tail length, which was not subjeeted to analysis, all eharaeters had significant geographie variation using one-way analysis of variance. The metric characters AGL and HLL both showed allometric growth in eomparison to SVL. To remove the effects of varying size and allometric growth the values for these two variables were log-transformed and adjusted to the values they would assume at a eonstant SVL using the formula (Thorpe, 1975)

$$\hat{y} = e^{\ln(yi)-a(\ln(xi)-\ln(x))}$$

where $\hat{y}$ is the adjusted dependent variable, yi is the raw dependent variable, xi is the SVL for that individual, x is the mean SVL aeross all samples and a the allometrie eoefficient from the regression $\ln(y) = a*\ln(x)+b$.

Values were adjusted to mean SVL 49.287mm. As an estimate of a the mean value of the allometrie coefficients for the three best sampled populations (populations 6, 9, and 23 corresponding to the three putative biochemical speeies) was used: 1.127 for AGL and 0.778 for HLL.

Canonical variates analyses were run with the nine eharacters, adjusted AGL, adjusted HLL, SCIL, MB, DSR, FS, TOES, FL, and TOEL, using SYSTAT (Wilkinson, 1987). Four analyses were run. In the first analysis, all twenty-three samples were treated as a priori groups (operational taxonomic units). In the second analysis,

the three putative species were used as groups. The final two analyses treated males and females separately, again using the three putative species as groups. In total, 210 animals were run in the first two analyses, while 88 males and 120 females were run in the last two analyses.

Two features of osteology were also surveyed but because of the more limited samples examined were not included in the main analysis above. These were number of presacral vertebrae (anterior to sacrum), and postsacral vertebrae (posterior to sacrum).

RESULTS

The results of combined electrophoretic and morphological analyses on 27 populations identified three major groups. The presence of one or more fixed allelic differences between regionally sympatric populations of each group was regarded as clear evidence of species level differentiation. Regional sympatry is here defined as species occuring in the same general vicinity but not necessarily within the same habitat or altitudinal range. From among these 27 populations sampled for electrophoretic analysis regional sympatry was observed between all possible pairings of the three major groups at one or more localities. On this basis, three species are recognised to which the following names apply: *S. challengeri* from the McPherson Ranges, SEQ and hinterland far NENSW; *S. rosei* from the eastern edge of the Great Dividing Range and associated ranges, NENSW and SEQ; and *S. galli* from isolated areas of the central and northern coast and adjacent ranges, NSW, and the McPherson Ra., SEQ.

Interspecific Variation

1. Electrophoresis: The electrophoretic results are presented in Table 2. A phenogram based on Nei's unbiased genetic distance is shown in Fig. 1. Three main groups of populations (separated at the 0.2 distance) can be recognised. There are fixed allozymic differences between all of these, including cases of sympatry or near sympatry, for each pair of groups.

All populations of *S. challengeri* and *S. galli* examined electrophoretically, including two instances where populations of each species occurred in ecological sympatry (syntopy), show fixed allelic differences for the *Ak*, *G-6-pdh* and *Idh-1* loci, and nearly fixed differences in *Est-1* and *Gpi*. In addition *S. challengeri* has only one observable *Mdh* locus, whereas *S. galli* and in-

FIG. 1. Phenogram of genetic similiarity based on Nei's unbiased genetic distance, populations 1-14 *S. rosei*, populations 15-19 *S. challengeri*, populations 20-27 *S. galli*.

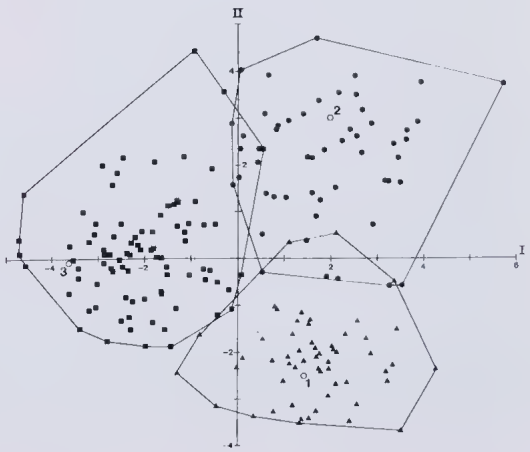

FIG. 2. Canonical variates analysis of 23 *Saproscincus* populations. Ordination of 23 populations on first two canonical variates. Points represent individuals as follows: dots = *S. galli*; squares = *S. rosei*; triangles = *S. challengeri*; open circles represent type specimens (1 = *S. challengeri*; 2 = *S. galli*; 3 = *S. rosei*). Polygons enclose scatter of points for each taxon.

Allozyme	Population 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Population 20	21	22	23	24	25	26	27
AK	4	5	3	1	4	5	3	1	10	4	3	1	8	4	3	4	8	5	5	5	4	2	2	2	4	3	5
A															1.000	1.000	1.000	1.000	1.000								
B							.333													.800	1.000	1.000	1.000	1.000	.500	.333	1.000
C	1.000	1.000	1.000	1.000	1.000	1.000	.667	1.000	1.000	1.000	1.000	1.000	1.000	1.000						.200					.500	.667	
AAT-1	4	5	3	1	4	5	9	6	12	4	3	1	8	4	4	5	9	5	8	7	4	5	4	2	4	3	9
A							.056																				
B	1.000	1.000	1.000	1.000	1.000	1.000	.944	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
AAT-2	4	5	3	1	4	5	9	6	12	4	3	1	8	4	4	4	9	5	8	7	4	5	4	2	4	3	9
A	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
EST-1	4	3	3	1	4	5	3	1	10	4	3	1	8	4	3	4	8	5	5	6	4	1	2	2	4	3	5
A										1.000	1.000			1.000						.167	.250	1.000	.500	1.000	.667	1.000	.100
B	.750	.500	.500	1.000			.667																				
C		.167										.500	1.000							.750	.750		.500				.800
O	.250	.333	.500		.125	.400	.333		.350																		
E												.500			.833	.625	.813	.600	.500	.083					.333		.100
F					.625	.400		1.000	.650																		
G															.167	.375	.188	.400	.500								
H					.250	.200																					
FBP	2	3	1	1	4	1	9	6	10	4	3	1	8	4	1	4	9	5	8	4	4	3	2	2	4	3	9
A							.167																				
B	1.000	1.000	1.000	1.000	1.000	1.000	.833	1.000	1.000	1.000	1.000	1.000	.875	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
FUM	4	5	3	1	4	5	9	6	12	4	3	1	8	4	2	4	9	5	8	4	4	3	2	2	4	3	9
A	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
G6PDH	1	2	1	1	4	3	3	1	7	4	3	1	8	4	4	4	5	3	6	5	4	1	2	2	2	2	4
A		.250																									
B	1.000	.750	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000						1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
C															1.000	1.000	1.000	1.000	1.000								
GPI	4	5	3	1	4	5	6	3	12	4	3	1	8	4	4	4	9	5	8	6	4	4	3	2	4	3	6
A										.750	.500		.125	.250													
B															1.000	1.000	1.000	1.000	1.000					.500			.083
C	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.250	.500	1.000	.875	.750						1.000	1.000	1.000	1.000	.500	1.000	1.000	.917
GA3PD	4	5	3	1	4	5	7	4	12	4	3	1	8	4	4	4	9	5	8	6	4	5	4	2	4	1	9
A																		.200									
B	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.800	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
GPD	4	4	3	1	4	5	3	2	6	4	3	1	7	4	4	5	5	5	6	6	4	4	4	2	4	1	4
A															.125												
B	.875	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.875	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
C	.125																										
IDH-1	4	5	1	1	4	5	8	6	12	4	3	1	8	4	4	5	9	5	9	4	4	4	4		2	3	8
A															1.000	1.000	1.000	1.000	1.000								
B	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000						1.000	.875	1.000	1.000			1.000	1.000
C																					.125				.750		
D																									.250		
IDH-2															4	5	9	5	9	1	3	1	3		1	1	1
A																		.200									
B															1.000	1.000	.833	.700	.944	1.000	.167					1.000	
C																	.167	.100	.056		.167		1.000		1.000		
LOH	4	3	3	1	4	5	9	6	10	4	3	1	8	4	4	5	7	5	9	7	4	4	2	2	4	3	7
A																		.200									
B	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.800	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
MDH-1	4	5	3	1	4	5	9	6	12	4	3	1	8	4	3	5	9	5	7	4	4	3	2	2	4	1	9
A																		.200									
B	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.800	1.000	1.000	.875	1.000	1.000	1.000	1.000	1.000	1.000
C																					.125						
MDH-2	4	5	3	1	4	5	7	4	12	4	3	1	8	4						4	4	3	2	2	4	1	8
A	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000						1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
MP1	4	3	3	1	4	5	7	6	10	4	3	1	8	4	3	5	8	5	4	5	4	3	2	2	4	3	7
A	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000													
B															1.000	1.000	.875	.900									
C																	.125	.100	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
PEPLA	4	5	3	1	4	5	5	3	8	4	2	1	8	4	4	5	5	5	4	4	4	4	5	4	2	4	6
A										.250	.250	1.000	.938	.500													
B	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000						1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
C										.750	.750		.063	.500													
PEPLG	4	5	3	1	4	5	6	4	8	4	3	1	8	4	4	5	6	5	5	5	4	5	4	2	4	3	7
A	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
PEPPP	4	5	3	1	4	5	5	3	8	4	3	1	8	4	2	3	1	3	3	3	4	3	3	2	4	3	6
A																									.250		
B	.875	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.833					1.000	.750	1.000	
C																			.167								
D																				1.000	1.000	1.000	1.000				1.000
E	.125																										
PGM	4	5	3	1	4	5	9	6	12	4	3	1	8	4	4	5	9	5	9	7	4	5	4	2	4	3	9
A	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.938	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
B													.063														
6PGDH	4	5	3	1	4	5	9	6	12	4	3	1	8	4	3	4	9	5	8	4	4	3	2	2	4	3	9
A					.125																						
B	1.000	1.000	1.000	1.000	.875	1.000	1.000	1.000	1.000																		
C															1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
D										1.000	1.000	1.000	1.000	1.000													
SOD	4	4	3	1	4	5	9	5	10	4	3	1	8	4	3	4	8	5	8	5	4	2	2	2	4	3	8
A	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
TPI	4	5	3	1	4	5	9	6	10	3	2	1	8	4	4	5	9	5	8	7	4	5	4	2	4	3	9
A	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
UDPG	4	3	3	1	4	5	2	1	7	4	2	1	8	4	2												
A	1.000	1.000	1.000	1.000	1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	4	2	2	3	5	4	4	4	2	4	3	4
B							1.000									1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 2: Gene frequencies in the studied *Saproscincus* populations. Populations 1 - 14 are *S. rosei*, 15 - 19 are *S. challengeri* and 20 - 27 are *S. galli*. Population identifications are given in the text. Numbers in the same row as locus identifications indicate sample sizes. Where no frequency is listed for IDH-2 or MDH-2, the locus is not present in the population.

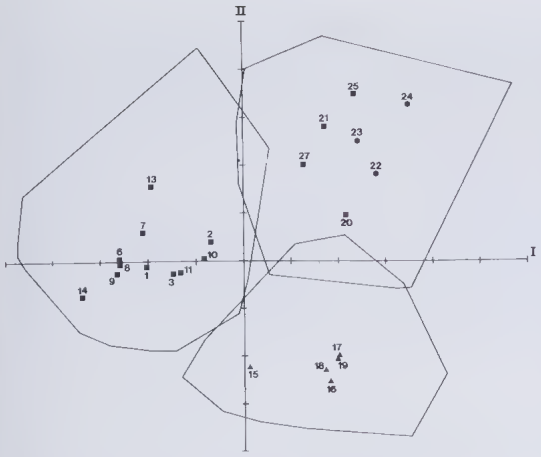

FIG. 3. Canonical variates analysis of *Saproscincus* populations. Same axes and polygons as Fig. 2. Group centroids (numbered) of populations. Dots = *S. galli*; squares = *S. rosei*; triangles = *S. challengeri*. Populations 4-5, 12 and 26 analysed biochemically but not included in canonical variates analysis.

deed all other examined *Saproscincus* taxa have two.

S. challengeri (populations 17-19) and regionally sympatric *S. rosei* from NENSW (population 12 separated by less than 10km from population 17) and SEQ (population 13) showed fixed allelic diferences at the *Ak*, *G-6-pdh*, *Gpi*, *Idh-1*, *Mpi*, *Pep-la* and *6-Pgdh* loci, in addition to the absence of a scorable *Mdh-2* from *S. challengeri* and a scorable *Idh-2* from *S. rosei*. With the exception of *Pep-la*, the differences listed above also distinguish *S. challengeri* from allopatric *S. rosei*.

S. galli and *S. rosei* show fixed allelic differences for the *Mpi* and *6-Pgdh* loci for all populations examined, including three instances of regional sympatry between *S. galli*. and *S. rosei*.

2. Morphology: The initial canonical variates analysis, using populations as OTUs, identified three largely distinct groups of populations on the first two functions (Figs 2-3; Table 3). These three groups corresponded exactly with the groupings determined biochemically. Factor 1 separated two clusters of populations (groups 1+2 and group 3) largely on the basis of subdigital lamellae (FL, TOEL) while factor 2 separated a third population (group 2 from group 1) largely on the basis of midbody scale rows, supraciliaries, and supradigital scales (MB, SCIL, TOES; Table 3). Canonical scores for primary type specimens (see below) of the available names within the *S. challengeri* complex were calculated using the functions: the lectotype of *S. challengeri* was placed among group 1; the holotype of *S. galli* lay among group 2; and the holotype of *S. rosei* lay among group 3. One other name has been previously placed in the synonomy of *S. challengeri* (Cogger et al., 1983). *Mocoa spectabilis* De Vis (1888) was described from specimens from Gympie, SEQ. Of the four identifiable types in the Queensland Museum (Covacevich, 1971; Cogger et al., 1983) one (QM J244) (Fig. 4) is *S. galli*, while the other three (QM J255, J19742-43) agree in all respects with *S. basiliscus* (Ingram & Rawlinson, 1981), a species not known from further south than the Mackay district, MEQ. Diagnostic characters of the latter species shown by these three specimens include the presence of a divided nuchal scale bordering the parietal and two tertiary temporals bordering the posterior edge of the lower secondary temporal scale. Designation of J19743 (Fig. 5) as lectotype by Wells & Wellington (1985) means that *Mocoa spectabilis* becomes a senior synonym of, and the available name for the taxon previously known as *Saproscincus basiliscus*.

Treating the three species as OTUs in the second canonical variates analysis resulted in 96.2% of specimens being correctly identified (96.7%, n=63 of *S. challengeri*; 98.2%, n=58 of *S. galli*; and 94.8%, n=101 of *S. rosei*). Canonical coefficients and loadings for characters for the two functions extracted are given in Table 4. Group classification coefficients are presented in Table 5, allowing unknown specimens to be assigned to species.

TABLE 3.Standardised discriminant function coefficients (and correlations with discriminant functions) for the first seven discriminant functions of nine characters from the *Saproscincus challengeri* complex. Twenty-three of the 24 populations biochemically sampled are used as a priori groups. Group 12, represented by a single individual, not used in determining functions.

Variable	I	II	III	IV	V	VI	VII
AGL (adj)	0.049(0.012)	0.162(0.164)	-0.119(0.004)	-0.037(0.097)	0.482(0.408)	-0.007(0.032)	0.551(0.646)
HLL (adj)	0.151(0.216)	-0.234(-0.173)	0.162(0.170)	0.359(0.357)	-0.617(-0.601)	0.305(0.323)	-0.137(-0.061)
MB	-0.159(-0.131)	-0.609(-0.484)	0.267(0.383)	0.204(0.158)	0.128(0.159)	0.196(0.105)	0.288(0.347)
DSR	-0.215(-0.138)	0.215(0.145)	0.605(0.659)	0.267(0.312)	-0.175(-0.045)	-0.665(-0.629)	0.059(0.123)
SCIL	-0.254(-0.106)	0.577(0.487)	-0.135(-0.125)	-0.164(-0.231)	-0.529(-0.522)	-0.036(0.003)	0.292(0.376)
FL	0.403(0.715)	0.032(0.117)	-0.284(0.029)	0.135(0.066)	0.209(0.109)	-0.536(-0.350)	-0.492(-0.251)
FS	0.065(0.311)	0.079(0.200)	0.641(0.664)	-0.788(-0.525)	0.080(0.107)	0.254(0.256)	-0.192(-0.173)
TOEL	0.685(0.856)	-0.170(0.068)	0.055(0.141)	-0.068(-0.012)	-0.206(-0.133)	0.039(-0.052)	0.640(0.386)
TOES	-0.020(0.272)	0.581(0.547)	0.102(0.299)	0.648(0.461)	0.242(0.287)	0.497(0.429)	-0.133(-0.111)

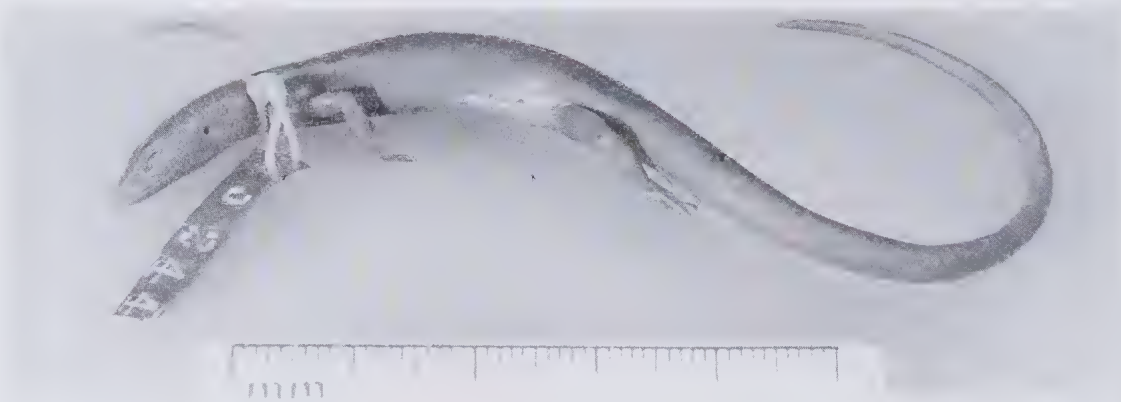

FIG. 4. QM J244 syntype of *Mocoa spectabilis* De Vis, a specimen of *S. galli*.

Treating both sexes seperately did not offer any noticeable improvement in resolution. Overall, 96.6% of males and females were correctly assigned to groups.

INTRASPECIFIC VARIATION

1. Electrophoresis: The electrophoretic results clearly demonstrate that there are at least three species level taxa in the *S. challengeri* group. The Nei distances separating lineages within these groups are, however, quite high, the distances approaching, in the case of *S. galli*, the figure of 0.15 which has been suggested (Thorpe, 1982; Nei, 1987) as a criterion for determining the specific status of a population when this is otherwise unresolvable. This figure is probably too low for lizards, as sister species in this group, with the exception of some iguanids (Gorman & Kim, 1976; Adest, 1977; Case & Williams, 1984), generally exhibit Nei distances of more than 0.2 (Kim et al., 1983; Milton et al., 1983; Busack, 1986; Daugherty et al., 1990). Nevertheless, the possibility of taxonomic structuring within *S. rosei*, *S. galli*, and *S. challengeri* should be considered .

On the basis of genetic (Nei distance) similarity two subgroups of *S. rosei* are recognised. One includes populations from central eastern and NENSW, the other populations from SEQ. Included in the SEQ subgroup are distinctive regionally restricted high altitude populations in the eastern border ranges. The first subgroup has fixed differences from the second for *Pep-la* and *6-Pgdh*, and a nearly fixed difference for *Est.* Another distinguishing feature of the SEQ subgroup is the presence, at a relatively high frequency of the GPI A allozyme, which is absent from the central-eastern and north-eastern subgroup of

FIG. 5. QM J19743 syntype of *Mocoa spectabilis* De Vis designated as lectotype for the species by Wells & Wellington, 1985.

TABLE 4.Standardised discriminant function coefficients (and correlations with discriminant functions) of nine characters from the *Saproscincus challengeri* complex. The three putative species based on biochemical data used as a priori groups.

	Discriminant Function	
Variable	I	II
AGL (adjusted)	-0.131(-0.075)	0.247(0.165)
HLL (adjusted)	0.290(0.290)	-0.305(-0.109)
MB	0.146(0.060)	-0.683(-0.537)
DSR	-0.363(-0.146)	-0.040(-0.039)
SCIL	-0.485(-0.306)	0.472(0.419)
FL	0.283(0.607)	0.272(0.423)
FS	0.048(0.177)	0.028(0.180)
TOEL	0.725(0.732)	0.126(0.418)
TOES	-0.254(0.059)	0.431(0.435)

S. rosei. Within the SEQ subgroup of *S. rosei* there is a fixed difference for *Est* between the high altitude populations in the eastern Border Ranges and those populations to the west and north. In these high altitude populations the GPI A and PEP-LA C allozymes are found in low frequencies but occur at frequencies of more than 50% in other populations of the SEQ subgroup of *S. rosei*.

Two subgroups of *S. galli* were identified, separated at a Nei unbiased distance of about 0.1. One subgroup comprises the populations from the Dorrigo region in the central part of the species range, the other subgroup, separated by several hundred kilometres from the first, comprises the northern and southern populations. No morphological differences were observed to support differentiation of the Dorrigo populations of *S. galli* from those to north or south. The electrophoretic differentiation is due to a fixed difference between the subgroups for *Pep-pp* and the relatively high frequencies of allozymes AK C, IDH-1 C and D, and GPI B which are found at lower levels in other *S. galli*. The *Pep-pp* B allozyme which distinguishes Dorrigo *S. galli* from other populations of this species is fixed in *S. rosei* and nearly fixed in *S. challengeri*. The presence of the allozyme may be due to its retention in Dorrigo *S. galli* rather than evolution *in situ*. The frequency differences for other allozymes may be due to local adaptations or genetic drift but do not suggest that the Dorrigo *S. galli* is greatly genetically isolated from other populations of this species.

TABLE 5.Fisher group classification function coefficients for the three species in the *Saproscincus challengeri* complex. Individual animals are assignable to the taxon with the highest function value.

	challengeri	*galli*	*rosei*
AGL (adjusted)	11.352	12.269	11.895
HLL (adjusted)	18.156	16.279	16.614
MB	20.325	17.051	19.114
DSR	10.064	10.304	10.805
SCIL	43.111	50.560	49.498
FL	13.693	14.325	12.654
FS	0.264	0.311	-0.047
TOEL	0.555	-0.063	-1.773
TOES	-2.373	0.803	-0.376
Constant	-1124.175	-1130.669	-1112.650

The populations of *S. challengeri* showed little genetic variation across their range, a notable exception being the fixation of the MPI D allozyme in the Mt Warning population, this form being at low frequencies elsewhere. The range of the species is, however, small in comparison to that of *S. galli* or *S. rosei* so the same degree of genetic structuring should not be expected.

2. Morphology: Within each of the three major species there was little additional resolution of populations on subsequent discriminant functions in the first analysis. Factor 3 partially separated the regionally restricted high altitude populations of *S. rosei* (Population 13 - Toolong Falls) in the eastern McPherson Range from other populations of *S. rosei*, although much overlap remained.

Presacral and postsacral vertebrae number was surveyed for a sample of individuals (n=88) representing most of the populations examined. *S. challengeri*, *S. galli*, and populations of *S. rosei* from central eastern and NENSW usually had 27, rarely 28 or 26 presacral vertebrae, while populations of *S. rosei* from SEQ (including population 13) usually had 28, occasionally 29 presacral vertebrae.

SPECIES DESCRIPTIONS

Saproscincus challengeri (Boulenger, 1887)
Figs 6-8

Lygosoma challengeri Boulenger, 1887: 575.

Type material. Lectotype BMNH 1946.8.16.55 (Fig. 6), Paralectotype BMNH 1946.8.16.56 Queensland.

Specimens Examined

The following specimens were used in the description, and include those used in the canonical variates analysis and electrophoretic analysis (morphological analysis only *; electrophoretic analysis only !).

Border Ranges NP, Lophostemon Falls on Brush Box Falls track (population 17), 28.24'S, 153.04'E (R133463-66; R133467-71*, R138062-66); Mt Warning NP (population 19), 28.'24S, 153.18'E (R133450*; R133451-53; R133454-56*; R133457; R133458-61*; R138005-06*, R138017-18; R138019*,R138020!; R138021-22; R138023-24*, R138026*, R138028-30*); Nightcap NP, vicinity of Terania Ck picnic area (population 18), 28.34'S, 153.18'E (R138077-78; R138079-82*; R138083-

FIG. 6. BMNH 1946.8.16.55 syntype of *Lygosoma challengeri* Boulenger designated as lectotype for the species by Wells & Wellington, 1985.

87*); Dome Mt. area, Yabbra SF (population 16), 28.28'S, 152.40'E (R135469, R135471); 28.27'S, 152.39'E (R135470); 28.27'S, 152.34'E (R135472-73); Tooloom Ra., Yabbra SF (population 15), 28.38'S, 152.29'E (R135461-62; 135465-66); 28.35'S, 152.29'E (R135459-60*); 28.34'S, 152.29'E (R135463*, R135468*).

Other specimens used to map the distribution of this species, *S. galli* and *S. rosei* are listed in appendix1.

Diagnosis

The following features in combination generally distinguish *S. challengeri* from other members of the *S. challengeri* species group: maximum adult size 57mm; supraciliaries usually 6; lamellae beneath fourth finger 15-19; lamellae beneath fourth toe 22-27; presacral vertebrae usually 27; postsacral vertebrae 45-48; dorsal surface uniform brown; ventral surface with irregular brown spotting; dorsal surface of tail usually with several moderately large, pale vertebral blotches anteriorly; abdomen of adult males uniformly cream or with a pale yellow wash.

The first, fourth, and ninth characters will distinguish *S. challengeri* from *S. rosei* which reaches a greater adult size (maximum SVL 64mm), usually has fewer fourth toe lamellae (17-24), and lacks moderately large tail blotches. The fifth and eighth characters will also distinguish *S. challengeri* from regionally sympatric northern populations of *S. rosei* which have 28-29 presacral vertebrae and the markings on the ventral surface faint and regularly aligned.

The second, and sixth to tenth characters will distinguish *S. challengeri* from *S. galli* which usually has 7 supraciliaries, 48-53 postsacral vertebrae, a mottled dorsal colour, the markings on the ventral surface regularly aligned, pale markings on the dorsal surface of the tail present as isolated spots a single scale in size, and the abdomen of adult males a bold lemon yellow.

Description

Measurements: Maximum SVL 57mm; TL 137-168% of SVL (x=155.8%, n=27); AG 51-59% of SVL (x=55.6%, n=62); HL 36-44% of SVL (x=41.3%, n=60).

Scalation: Nasals widely separated; prefrontals moderately to narrowly separated; supraciliaries 6-7 (x=6.0, sd=0.16, n=63); upper labials 6, rarely 7; midbody scale rows 23-26 (x=24.6, sd=1.0, n=63); paravertebral scales 54-63 (x=57.6, sd=1.6, n=63), fourth finger scales 9-11 (x=10.0, sd=0.3, n=63); fourth finger lamellae 15-19 (x=17.3, sd=0.9, n=63); fourth toe scales 11-13 (x=11.2, sd=0.4, n=63); fourth toe lamellae 22-27 (x=24.3, sd=1.0, n=63).

Osteology: Presacral vertebrae 27-28 (x=27.1, sd=0.3, n=16); postsacral vertebrae 45-48 (x=46.8, sd=1.1, n=12).

Colour and pattern: The populations of *S. challengeri* are generally similar. Two forms of sexual dichromatism, both at low frequencies, occur in certain populations. Dorsal surface usually overall mid brown (occasionally lighter or darker),

uniform or with scattered pale brown scales. Dorsolateral region with dark flecking along scale rows 3 and 4 forming a rough-edged stripe at least anteriorly, and variably extending partly or wholly along the body and basal portion of the tail. Where dark dorsolateral markings continue to level of hindlimb these may occasionally be bordered above by a pale, poorly defined, brown to russet hip stripe. Head with a bold dark brown loreal streak between nares and eye, becoming narrower and obscure behind eye and generally not continuous with dark dorsolateral stripe. Dorsal and lateral surfaces of tail similar to body, usually marked with several moderately large, pale vertebral blotches anteriorly, rarely uniform, and occasionally defined by a continuation of the fine dark dorsolateral flecking on scale rows 3 and 4 of body. Dark lateral and pale ventral surfaces of tail in bold contrast and the ventrolateral margin of tail defined by a fine but obvious black stripe. Ventral surface white with sparse to heavy scattering of mid brown spots positioned in either the centre or edge of the individual ventral scales. In life adults males generally have a pale yellow wash to the posterior half of the abdomen, occasionaly extending to the underside of hindlimbs and basal portion of tail, whereas adult females generally lack such colour or only occasionally have a very weak yellow flush to the posterior half of the abdomen.

Two colour patterns were observed in females of this species. A small proportion of females (approximately 10-20%) from all populations had a uniform mid brown dorsal surface bordered by a smooth, well defined, pale edged, dark dorsolateral stripe continous along the body and tail and contrasting with the darker brown lateral colour to the body and tail. In the Nightcap Range population a small percentage of females had a relatively plain mid brown dorsal surface and boldly contrasting uniformly darker brown upper lateral surface bordered below by a broad, bold white stripe which occupied most of the mid and lower lateral region, particularly in the region of the forelimb. One of these 'white-striped' specimens had the dorsal and lateral surfaces further distinguished by a narrow, pale brown laterodorsal stripe along the entire length of the body and basal portion of the tail.

DISTRIBUTION, HABITAT

S. challengeri is restricted to the McPherson Ra. and its hinterland (Fig. 8). In NSW it occurs in the ranges of the Mt Warning caldera (Mt Warning, Nightcap Ra.), southern edge of the McPherson Ra., and the Tooloom and Richmond Ras. In SEQ it occurs throughout the McPherson Ra. from its eastern margin west to Cunningham's Gap and adjacent Mt Tambourine, and has been recorded from coastal lowland at Beenleigh and Scotts Is. in the lower reaches of the Tweed R.

Throughout most of its range it inhabits closed gully forest from sea level to 500 m. *S. challengeri* is a conspicuous, surface active, diurnal species that inhabits the forest floor and edges of streams in closed forest, where it can be relatively abundant. It is sympatric with *S. galli* at two localities, Breakfast Ck at Mt Warning and Sheepstation Ck in the border ranges. Both

FIG. 7. *S. challengeri*, Lamington Plateau, SEQ.

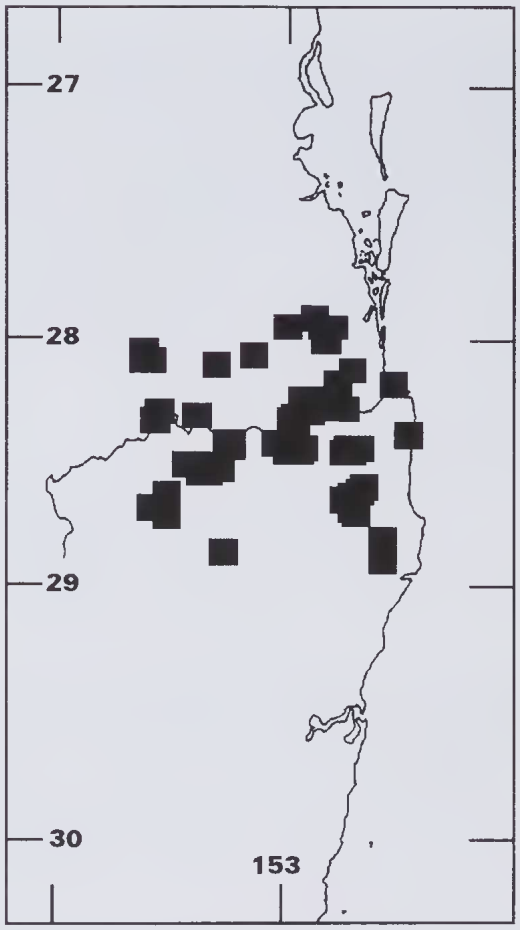

FIG. 8. Distribution of *S. challengeri* (closed squares).

localities are small gully creeks running through closed forest at mid to low (<500 m) altitude. At these sites *S. challengeri* is widespread and moderately abundant on the forest floor bordering and adjacent to the streams, whereas *S. galli* is rarely encountered away from the stream and, in contrast, difficult to observe, tending to shuttle between sheltering sites and remain secretive, rarely appearing to bask in the open.

Saproscincus galli Wells & Wellington, 1985
Figs 9-12

Saproscincus galli Wells & Wellington, 1985:37.
Holotype: AMS R116964 (AMH 16800) (Fig. 9)

SPECIMENS EXAMINED

The following specimens were used in the description, and include those used in the canonical variates analysis and electrophoretic analysis (morphological analysis only *; electrophoretic analysis only !).

Lamington NP, Toolona Gorge area on Toolona Falls track (population 21-part), 28.15'S, 153.10'E (R140660-62); Lamington NP, Toolona Falls (population 21-part), 28.15'S, 153.10'E (R140667, R140674); Border Ras NP, vicinity of Brindle Ck rest area (population 22), 28.22'S, 153.03'E (R138031-33, R138042; R138043-44*); Mt Warning NP, vicinity of Breakfast Ck carpark (population 20), 28.23'S, 153.17'E (R133456!; R133458!; R138000-01*, R138007-09, R138016*, R138070, R138072); Border Ras NP, Lophostemon Falls on Brush Box Falls track (population 23), 28.24'S, 153.01'E (R138047-48, R138049*; R138050-51); Twelve Sixty Flora Reserve, Coffs Harbour district (population 26), 30.07'S, 152.55'E (R138207!, R138409-10!); Mobong Falls, Wild Cattle SF (population 25), 30.10'S, 152.47'E (R134986-87, R138191-92); Dorrigo NP, Never Never picnic area (population 24), (R138174*; R138175-76); Cooper's Park, Bellevue Hill, Sydney (population 27), 33.51'S, 151.17'E (R71622-26*, R71628*, R71709-14*, R93768-69*, R132041-44; R132045*; R132046, R138404-07; R138408*).

DIAGNOSIS

The following features in combination generally distinguish *S. galli* from other members of the *S. challengeri* species group: maximum adult size 59mm; supraciliaries usually 7; lamellae beneath the fourth finger 16-21; lamellae beneath the fouth toe 22-28; presacral vertebrae usually 27; postsacral vertebrae 48-53; dorsal surface a mosaic of lighter and darker scales; ventral surface with regularly aligned faint brown spotting tending to form longitudinal rows; lateral and dorsal surfaces of tail barely diffcrentiated, the markings tending to be a continuation of the overall dorsal colour pattern; abdomen of adult males bold lemon yellow.

The second, and sixth to tenth characters will distinguish *S. galli* from *S. challengeri* as outlined in the diagnosis of *S. challengeri*.

The first, third to fourth, and tenth characters will distinguish *S. galli* from all populations of *S. rosei* which reach a greater adult size (maximum SVL 64mm), generally have fewer lamellae beneath the fourth finger and toe, and lack bold ventral colour. Characters seven and eight further distinguish *S. galli* from sympatric southern populations of *S. rosei* which have a more more uniformly coloured dorsal surface and the ventral surface marked with irregular brown spots. Characters five and nine will further distinguish *S. galli* from sympatric northern populations of *S. rosei* which have more presacral vertebrae and in subadults and females a bold russet hipstripe which define the dorsal and lateral surface of the

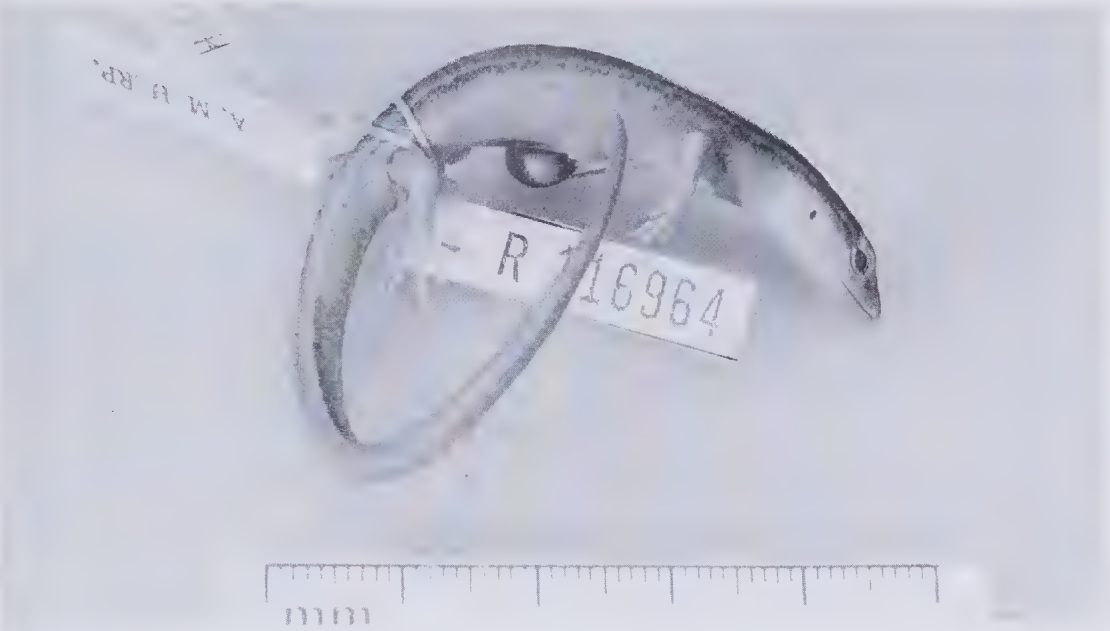

FIG. 9. AMS R11694 holotype of *S. galli* Wells & Wellington.

tail anteriorly, this latter character though present in subadult and female *S. rosei* from southern populations is less bold.

DESCRIPTION

Measurements: Maximum SVL 59mm; TL 139-192% of SVL (x=165.0%, n=28); AG 53-62% of SVL (x=56.8%, n=58); HL 35-44% of SVL (x=39.7%, n=57).

Scalation: Nasals widely separated; prefrontals moderately to narrowly separated; supraciliaries 6-8 (x=6.8, sd=0.3,n=58); upper labials 6, rarely 7; midbody scale rows 22-24 (x=22.7, sd=0.9, n=58); paravertebral scales 54-61 (x=57.9, sd=1.7, n=58), fourth finger scales 9-11 (x=10.2, sd=0.4, n=57); fourth finger lamellae 16-21 (x=17.9, sd=1.0, n=57); fourth toe scales 11-14 (x=12.3, sd=0.9, n=58); fourth toe lamellae 22-28 (x=24.8, sd=1.4, n=58).

Osteology: Presacral vertebrae 26-28 (x=27.0, sd=0.3, n=41); postsacral vertebrae 48-53 (x=50.3, sd=1.2, n=31).

FIG. 10. *S. galli*, ♂ Lamington Plateau, SEQ.

FIG. 11. *S. galli*, ♀, with white midlateral stripe, Border Ranges, NENSW.

Colour and pattern: The various populations of *S. galli* are similar in colour and pattern (Fig. 10).

Dorsal surface mid to dark brown with numerous scattered pale brown to cream scales. Dorsolateral region with dark flecking along scale rows 3 and 4 forming a rough-edged stripe at least anteriorly, and variably continuing partly or wholly along the body and basal portion of the tail. Lateral and dorsal surfaces of tail barely differentiated, the markings tending to be a continuation of the overall dorsal colour pattern. Ventral surface of tail pale with scattered brown spotting, contrasting with darker lateral surface but tending to grade into it at the ventrolateral margin. Head with a bold dark brown loreal streak between the naris and eye and continuous past the eye with the dark dorsolateral stripe. Ventral surface white with sparse to dense brown flecks which are generally aligned along the edge of the individual ventral scales, giving the appearance of rough longitudinal streaks on boldly marked individuals. In life adult males have a bold lemon yellow enamel flush to the abdomen.

A low frequency of two forms of sexual dichromatism occurs in females of this species, the combinations of which vary between populations. In populations from the Sydney region a small proportion (10-20%) of females have a uniform mid brown dorsal surface bordered by a smooth, well defined, pale edged, dark dorsolateral stripe continuous along the body and tail, contrasting with a darker brown lateral colour of the body and tail. In the McPherson Ranges a small percentage of females have a relatively plain mid brown dorsal surface and boldly contrasting uniformly darker brown upper lateral surface bordered below by a moderately broad, bold white, midlateral stripe (Fig. 11).

DISTRIBUTION, HABITAT

Saproscincus galli, although widespread is known from a limited number of sites over much of its range. It extends from Mt Tambourine and the McPherson Ra., SEQ to the Sydney region, NSW (Fig. 12). In the northern and central parts of its range it has been recorded mainly from closed forest in gullies. At only one locality in the central part of its range, Bellinger Is., has *S. galli* been recorded on the coastal plain. In the Sydney region this species is found in remnant patches of low, closed forest in the sandstone hills adjacent to Port Jackson, one of the more densely populated areas in the region. It is also known from urban gardens in near suburbs.

Saproscincus rosei Wells & Wellington
Figs 13-21

Saproscincus rosei Wells & Wellington, 1985:38.
Holotype: AMS R116963 (AMH 16801) (Fig. 13)

SPECIMENS EXAMINED

The following specimens were used in the description, and include those used in the canonical variates analysis and electrophoretic analysis (morphological analysis only *; electrophoretic analysis only !).

Conondale Ra., Booloumba Ck xing ca 15km by rd from SF camp (population 14), (R140655-56; R140657*; R140658-59); Mt Glorius, 5.6km N village (population 10), 27.16'S, 152.45'E (R140651-54); Mt Nebo, 1.5km N village (population 11), 27.33'S, 152.48'E (R140645-46*; R140647-49); Lamington NP, Toolona Falls (population 13), 28.15'S, 153.10'E (R140665; R140666*, R140668-70, R140672-73, R140676-77); Border Ras NP, Tweed Valley Lookout (population 12), 28.22'S, 153.05'E (R133485); Washpool NP, Coombadjha Ck, Coachwood Pool (population 1-part), 29.28'S, 152.18'E (R138098-100; R139101*; R138102); Washpool SF, 5.0km S Hayden's trig (population 1-part), 29.19'S, 152.18'E

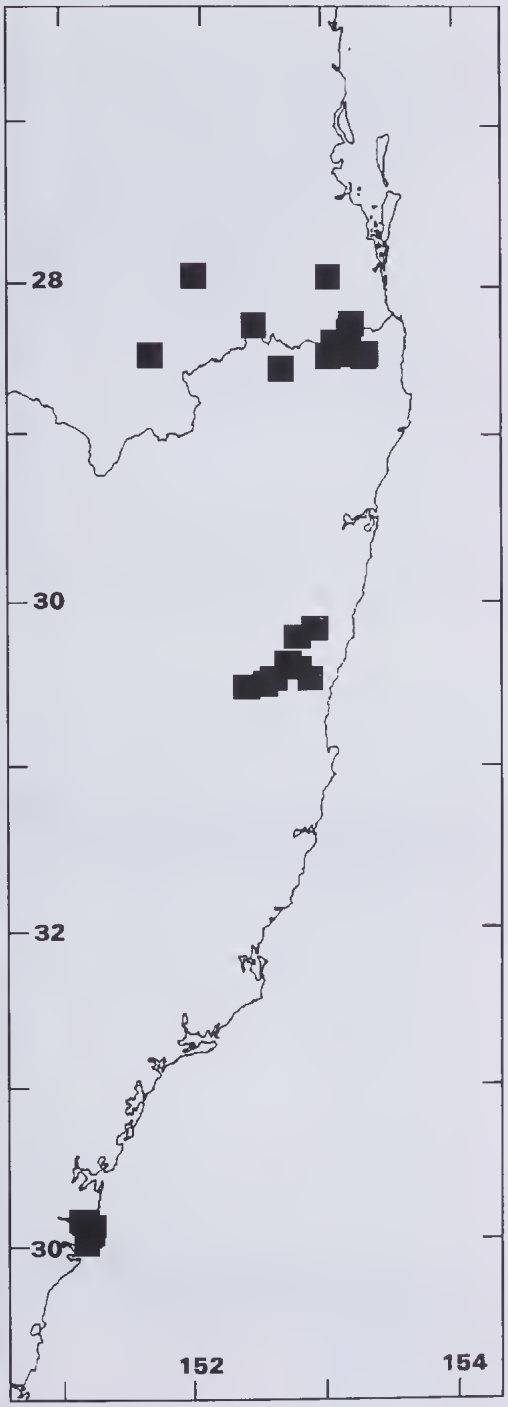

FIG. 12. Distribution of *S. galli*.

(R96793*); Lionsville fire trail, 6km N The Sugarloaf, Washpool SF (population 1-part), 29.23'S, 152.22'E (R96827*, R96877*, R96923-24*); Washpool SF, btn forks of Oorowin road 4km N The Sugarloaf (population 1-part), 29.24'S, 152.23'E (R96878-79*, R96921*); Washpool SF, off Old Coombadjha road, 9.5km N The Summit (population 1-part), 29.25'S, 152.21'E (R96803*); Gibraltar Ras NP, Cedar Valley (population 1-part), 29.28'S, 152.20'E (R96792*, R96888*, R96930*); Gibraltar Ras NP, Hakea picnic area (population 1-part), 29.28'S, 152.21'E (R96808*); Washpool, 29.30'S, 152.22'E (R92911*); Bruxner P, Coffs Harbour district (population 4), 30.15'S, 153.06'E (R138208!); Wild Cattle Ck SF, Measuring Hut rd, 1-6km N Cascade (population 5-part), 30.10'S, 152.47'E (R138218!); Dorrigo NP, Never Never picnic area (population 2), 30.21'S, 152.48'E (R138163-67; R138168*); Dorrigo NP, The Glades picnic area (population 3-part), 30.22'S, 152.43'E (R138184-86); Dorrigo NP, Crystal Shower Falls track (population 3-part), 30.23'S, 152.43'S (R138180)*; Chaelundi SF (population 5-part), (R135281-83!); Styx R. SF, Softwood rd (population 7), 30.32'S, 152.19'E (R130029-33; R130034*; R130035-36, R130038-39*, R138198-99); Plateau Beech, Werrikimbe NP (population 6), 31.10'S, 152.15'E (R130019-22); Mt Banda Banda Flora Reserve (population 8), 31.10'S, 152.25'E (R130023-27); Williams R., nr Barrington House (population 9), 32.10'S, 151.31'E (R130069-71, R130780-82; R130783, R130786-90; R130791*; R138092; R130793*; R130794-95.

DIAGNOSIS

The following features in combination generally distinguish *S. rosei* from other members of the *S. challengeri* species group: maximum adult size 64mm; supraciliaries usually 7, occasionally 6; lamellae beneath the fourth finger 14-18; lamellae beneath the fouth toe 17-24; presacral vertebrae 27-29 (usually 27 in southern populations and usually 28 in northern populations); postsacral vertebrae 46-54; dorsal surface uniform brown (southern populations) or with a mosaic of lighter and darker scales (northern populations); ventral surface with irregular brown spotting (southern populations) or regularly aligned faint brown spotting tending to form longitudinal rows (northern populations); dorsal surface of tail of subadults and adult females with a bold, russet dorsolateral hipstripe; abdomen of adult males usually with a pale yellow wash.

See accounts for *S. challengeri* and *S. rosei* for direct comparison between *S. rosei* and these species.

DESCRIPTION

Measurements: Maximum SVL 64mm; TL 137-192% of SVL (x=168.1%, n=31); AG 46-61% of SVL (x=57.1%, n=97); HL 34-44% of SVL (x=38.2%, n=97).

Scalation: Nasals widely separated; prefrontals

FIG. 13. AMS R11693 holotype of *S. rosei* Wells & Wellington.

FIG. 14. *S. rosei*, ♂, Mt Glorious, SEQ.

FIG. 15. *S. rosei*, ♀, Mt Glorious, SEQ.

FIG. 16. *S. rosei*, ♀, with white midlateral stripe, Mt Nebo, SEQ.

moderately to narrowly separated; supraciliaries 5-8 (x=6.6, sd=0.5, n=101); upper labials 6, rarely 7; midbody scale rows 22-26 (x=24.1, sd=0.9, n=101); paravertebral scales 55-67 (x=58.8, sd=2.2, n=101), fourth finger scales 8-11 (x=9.7, sd=0.8, n=100); fourth finger lamellae 14-18 (x=15.3, sd=0.9, n=100); fourth toe scales 10-14 (x=11.2, sd=0.6, n=100); fourth toe lamellae 17-24 (x=21.0, sd=1.2, n=100).

Osteology: Presacral vertebrae 27-29 (x=27.7, sd=0.7, n=31); postsacral vertebrae 46-53 (x=49.6, sd=2.3, n=20).

Colour and pattern: The following description applies to populations of *S. rosei* from MENSW (i.e. Bellinger R. region south to the Williams R.) including the type locality for *S. rosei*. Variation in colour and pattern elsewhere throughout the species range are discussed with respect to differences from the type population.

In specimens from MENSW the dorsal surface is usually overall mid brown (occassionally lighter or darker), uniform or with a few scattered pale brown scales. Dorsolateral region with dark flecking along scale rows 3 and 4 forming a broken, rough-edged stripe along the body and basal portion of the tail. Females with a poorly defined pale brown to russet hip stripe. Head with a bold dark brown streak between the naris and eye, becoming narrower and obscure behind the eye and generally not continuous with the dark dorsolateral stripe. Dorsal and lateral surfaces of tail in males generally similar, tending to be broken only by fine dark dorsolateral flecking where scale rows 4 and 5 overlap. The darker lateral and pale ventral surfaces of tail are in bold contrast, and defined by an obvious black stripe along the ventrolateral margin. Ventral surface white, with sparse to heavy scattering of mid brown spots. In life adult males generally have a pale yellow flush to the posterior half of the abdomen and a similiar or bolder yellow flush to the underside of hindlimbs and basal portion of tail, whereas adult females generally lack such colour or only occasionally have a very weak yellow flush to the very posterior edge of the abdomen, underside of hindlimbs and basal portion of tail. A low frequency of sexual dichromatism occurs in populations around the Dorrigo-Bellinger region. Some females had a relatively plain mid brown dorsal surface and boldly contrasting uniformly darker brown upper lateral surface bordered below by a broad, bold white mid lateral stripe. A narrow, pale brown laterodorsal stripe further defined the dorsal and lateral surfaces of the body.

Specimens from the Clarence River region north to the NSW-QLD border are intermediate in coloration between MENSW populations and those from SEQ. The dorsal surface is usually marked with a mosaic of lighter and darker scales;

FIG. 17. *S. rosei*, ♀, with dark vertebral stripe, Lamington Plateau, SEQ.

the russet hip-stripe is bold and well defined and the ventral surface is marked with regularly aligned faint brown spotting tending to form longitudinal rows. Adult ventral colour in life similar to MENSW populations.

A colour photograph of an adult female *S. rosei* from Mt Glorious, SEQ is figured by Wilson & Knowles (1988). The russet hip stripe of subadult and adult females tends to dominate the dorsal coloration. The ventral surface is marked with regularly aligned faint brown spotting tending to form longitudinal rows rather than with sparse to heavy scattering of mid brown spots (Figs 14-16). Adult ventral colour in life similar to central eastern NSW populations.

A low frequency of sexual dichromatism occurs in most SEQ populations. Some females have a relatively plain mid brown dorsal surface and boldly contrasting uniformly darker brown upper lateral surface bordered below by a broad, bold white mid lateral stripe. A narrow, pale brown laterodorsal stripe further defines the dorsal and lateral surfaces of the body.

Four coloration forms are recorded on the E McPherson Ra. population (Figs 17-20). The most common variant occurs in both sexes where darker flecking on the dorsal surface tends to concentrate down the middle of the body to form a rough, dark vertebral stripe (Fig. 17). The pale ventral surface is marked with regularly aligned faint brown spotting tending to form longitudinal rows. The yellow ventral colour in live adult males is more prominent than in other populations being present as a moderate to pale flush over the posterior part of the venter, underside of hindlimbs, and basal portion of tail (where it is boldest), and sometimes extending over most of the venter. It is similarly well developed in live adult females being present as a pale yellow wash to most of the venter in all but one individual.

A low frequency of two forms of sexual dichromatism was observed in females and one in males. One female had a relatively plain grey-brown dorsal surface (Fig. 18) the other a mid-dark brown dorsal surface with a mosaic of lighter and darker scales (Fig. 19). Both had boldly contrasting uniformly darker brown upper lateral surfaces bordered below by a broad, bold white mid lateral stripe, and bold, russet dorsolateral hip stripes which tend to dominate the dorsal coloration. A colour photograph of one of these forms from Lamington NP, SEQ is figured by Wilson & Knowles (1988). One male was completely patternless, being uniform grey-brown (Fig. 20).

DISTRIBUTION, HABITAT

S. rosei has a broad distribution extending from just south of Gympie (26°11'S), SEQ, to the Barrington Tops region (32°10'S) in central eastern NSW (Fig. 21). Over much of its range *S. rosei* occurs along the eastern edge of the Great Dividing Ra. and its associated near coastal ranges, but is noticeably absent from most of the McPherson Ra. and adjacent Richmond and Tweed Ranges, except for two isolated high altitude populations in the eastern McPherson Ra.

In SEQ, *S. rosei* occurs on the Great Dividing Ra. along the western edge of the Brisbane R. drainage, and north of the Brisbane R. drainage from the D'Aguilar, Conondale and Jimna Ranges and associated near coastal ranges. It is not known from the more inland Bunya Mts on the Great Dividing Ra., or from ranges south of the Brisbane R. drainage, except for the two isolated populations in the McPherson Ra.

S. rosei is a conspicuous, surface active, diurnal species that inhabits the edge of closed forest or open, sunlit, patches in the forest. It tends to be more abundant in the former situation where it is commonly observed basking among debris piles.

FIG. 18. *S. rosei*, ♀, with uniform dorsal surface and white midlateral stripe, Lamington Plateau, SEQ.

FIG. 19. *S. rosei*, ♀, with dark flecked dorsal surface and white midlateral stripe, Lamington Plateau, SEQ.

FIG. 20. *S. rosei*, ♂, with uniformly coloured dorsal and lateral surface, Lamington Plateau, SEQ.

In MENSW it has been recorded regionally sympatric with *S. galli* at a number of locations in the Dorrigo region. On the western edge of the McPherson Ra., SEQ. *S. rosei* has been recorded regionally sympatric with *S. challengeri* (Cunningham's Gap) and with *S. galli* (Mt Superbus). In the eastern McPherson Ra. it is restricted to high altitude closed forest, being found in creekside vegetation at the headwaters of Toolong Ck, where it was sympatric with *S. galli*, and from beside a foot-track through closed forest on a ridge on the adjacent Tweed Ra.

KEY

1. Supraciliaries usually 6; dorsum uniform brown; venter with irregular brown spotting; dorsal surface of tail usually with several moderately large, pale vertebral blotches anteriorly ..... *S. challengeri*

   Supraciliaries usually 7; dorsum uniform brown or with a mosaic of lighter and darker scales; venter with irregular brown spotting or regularly aligned faint brown spotting tending to form longitudinal rows; dorsal surface of tail without several moderately large, pale vertebral blotches anteriorly 2

2. Dorsum uniform brown; venter with irregular brown spotting; abdomen of adult males usually with a pale yellow wash ..... *S. rosei* southern populations

   Dorsal surface of body with a mosaic of lighter and darker scales; ventral surface with regularly aligned faint brown spotting tending to form longitudinal rows 3

3. Lamellae beneath the fourth toe 22-28; abdomen of adult males bold lemon yellow; lateral and dorsal surfaces of both sexes undifferentiated ..... *S. galli*

   Lamellae beneath the fourth toe 17-24; abdomen of adult males usually with a pale yellow wash; dorsal surface of tail of subadults and adult females with a bold, russet dorsolateral hipstripe ..... *S. rosei* northern populations

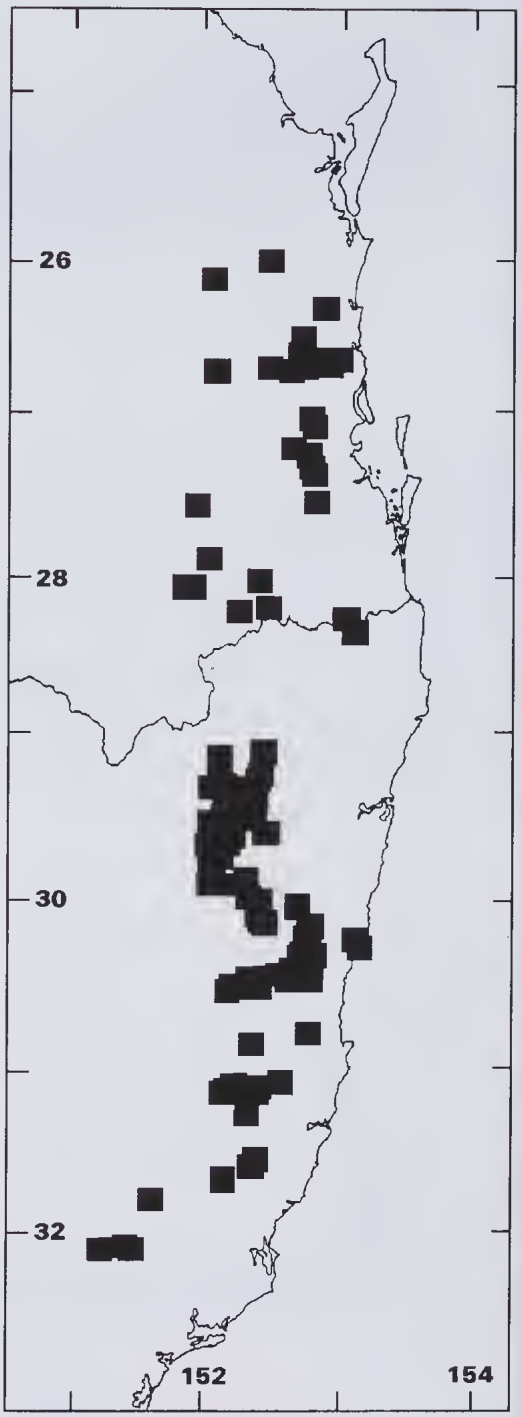

FIG. 21. Distribution of *S. rosei*.

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APPENDIX 1

Specimens examined (AM and QM) to prepare the distribution maps of *S. challengeri, S. galli,* and *S. rosei.*

Saproscincus challengeri Queensland Museum specimens: J3037-40; J3042; J7497; J12143-44; J12151-57; J12161-70; J13362-63; J13635; J16456; J18020; J18023; J21997; J22224; J22941-42; J24836; J24910; J26032-33; J26681-85; J26723; J27705-06; J27769-71; J27840-42; J28297-99; J30808; J32274-75; J34951-56; J34978-86; J35258-59; J42434-37; J49629; J49632; J49636; J49641; J49649; J49662; J49664; J49667; J49686; Australian Museum specimens: R8780; R15747-48; R18299; R18301-02; R18726; R20513-15; R52745-50; R55088-90; R85947-48; R87048-50; R92131-32; R95382; R96440-43; R97819-21; R97885; R104104; R111207; R130855; R130857; R130865; R130867; R130881; R130905; R131869-80; R132436-37; R132450; R132460-61; R132464; R133462; R135464; R138003-04; R138027; R138062-69; R138088-89; R138092-94; R138265-68; R138272-78; R139124-25; R139514-15; R139521-22; R140640-44. *Saproscincus galli* Queensland Museum specimens: J3041; J3043; J13636; J30564-67; J30569-74; J30671-72; J32276. Australian Museum specimens: R16997; R18540-44; R18565; R20319; R53742; R54341; R64519; R71627; R71629-32; R76549; R85724; R90604; R90614; R92133; R95613; R96588-96; R97817; R97836-46; R104284-87; R104304; R111737-40; R118999-119000; R127378: R130018; R132033-37; R132047-48; R132434; R132462; R133448-49; R138002; R138010-15; R138034-41; R138052-61; R138071; R138073-75; R138177; R138193-94; R138411-12; R139551; R140663-64; R140675. *Saproscincus rosei* Queensland Museum specimens: J1581; J3754; J12254; J14318; J16915; J18022; J20229; J20655; J21409; J22471; J22684; J24049-50; J24334-35; J24346; J25534; J26501; J26679;J26911; J28278; J29035; J29944; J30575; J30809; J32189; J32277;J36919; J36958; J37934; J42122; J49663; J49735; J51620; J51983. Australian Museum specimens: R16996; R17002; R43738; R43750; R49173-77; R52730-44; R53746; R54470-71; R54622-23; R54890-91; R61167-68; R61303; R62786; R85938-46; R90603; R96893; R97818; R99475; R103007-08; R103012; R103024-26; R103066; R104110; R104113; R107678; R108693-97; R108705-06; R108738; R108752; R111566-69; R112253-59; R112273; R130037; R130784-85; R130796-97; R132000-28; R132049-72; R132826; R137685; R137704; R137711; R137715-16; R137727; R137753; R137760; R137763-64; R137868-71; R138162; R138169; R138251-52; R138269-71; R138279-96; R138356; R138413-17; R139031; R139054-56; R139063; R139076; R139079; R139081; R139097; R139112; R139138; R139217; R139220; R139226-27; R139234; R139236-42; R139271; R139275-77; R139282; R139284; R139313-15; R139341; R139346-49; R139366-67; R139484-85; R139489; R139499; R139511; R139558-63; R139680-81; R139702-03; R139786; R139791; R140650; R140671; R141050; R141071; R141395; R141437; R141463; R141544; R141552-54; R141556; R141622; R141653.